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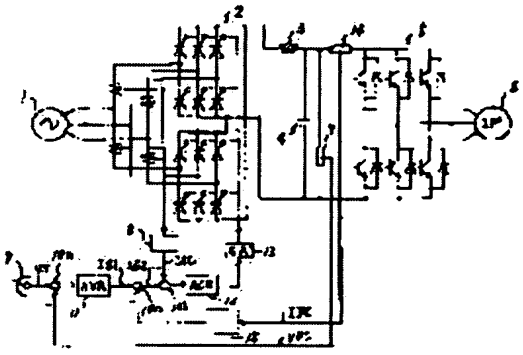
(54) VOLTAGE CONTROLLER FOR POWER CONVERTER

(57)Abstract:

PURPOSE: To suppress input voltage fluctuation to an inverter circuit by grasping an abrupt fluctuation in a motor load, as it is, as an abrupt input current fluctuation to the inverter circuit and detecting that current before a current control command for a power converter is corrected through a disturbance observation unit.



CONSTITUTION: Power from an AC power supply 1 is converted into DC power and fed through smoothing circuits 3, 4 to a motor driver. Disturbance corresponding to the inverse function of a transfer function leading to fluctuation of current at the time of abrupt fluctuation of load of a motor 6 is then observed and the fluctuation in the input current to an inverter circuit 5 is grasped in the functional relationship of a load compensator 15. A control command for a current controller 12 is then compensated by an output from the load compensator 15 thus improving the voltage control of a power converter at the time of fluctuation of load. This constitution suppresses fluctuation in the power supply voltage for the inverter circuit 5 which is thereby protected against breakdown due to overvoltage.

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CLAIMS

[Claim(s)]
[Claim 1] Change AC power supply into a direct current, and power is supplied to a motor driving gear through a smoothing circuit. Or it sets to the armature-voltage control equipment of the power converter which has a current control system in a minor loop by direct-current-voltage control of the semiconductor power converter which absorbs power and returns power to AC power supply from a motor load. Armature-voltage control equipment of the power converter characterized by having a means to observe the disturbance equivalent to the inverse function of the transfer function which results in the current change in the case of motor-load sudden change, and carrying out negative feed-back to the input signal circuit of said current control system through this means while detecting the signal equivalent to the direct-current output current.
[Claim 2] Armature-voltage control equipment of the power converter according to claim 1 which used the signal which replaces with said direct-current output current, and is equivalent to the capacitor current of said smoothing circuit.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the armature-voltage control equipment of the power converter which performs load compensation of the example of a thyristor converter of the input power of the inverter circuit which drives an induction motor.
[0002]
[Description of the Prior Art] An example of a thyristor converter is shown in drawing 3 as an input current of the motor driving gear by the inverter. Drawing 3 shows the important section configuration and control system of the conventional example, and, for a power converter and 3, as for a capacitor and 5, a reactor and 4 are [1 / AC power supply and 2 / an inverter circuit and 6] induction motors (only henceforth a motor). 7 [moreover,] -- for an electrical-potential-difference setter, and 10a and 10b, as for an armature-voltage control machine and 12, an adder subtracter and 11 are [an electrical-potential-difference detector and 8 / a current detector and 9 / a current limiter and 13] gate control machines.
[0003] That is, in the power converter shown in drawing 3 , a power converter 2 changes AC power supply 1 into DC power supply, and serves as a supply power source of an inverter circuit 5. Moreover, when absorption of the power by the side of a load, i.e., the power of an inverter circuit 5, is needed, a power converter 2 changes the power from this load side, and has the function of that regeneration power of control. A reactor 3 and a capacitor 4 play the role which offers the DC power supply which carried out smooth [of the part for the pulsating flow of power converter 2 output]. An inverter circuit 5 changes a direct current into the three-phase-alternating-current power source of an adjustable electrical potential difference and a variable frequency, and drives a motor 6.
[0004] The electrical-potential-difference detector 7 obtains the output voltage VDC for controlling the supply voltage to an inverter circuit 5. IDC is the output current. Moreover, the current detector 8 obtains the input current IAC of a power converter 2. Now, a difference with output voltage VDC is acquired to the electrical-potential-difference set point by the electrical-potential-difference setter 9 in adder subtracter 10a, from adder subtracter 10a, the control command of the armature-voltage control machine 11 is given, and a current control command is outputted from the armature-voltage control machine 11. Here, the relation between the input current IAC of a power converter 2 and the output current IDC is expressed with a degree type.
[0005]
IAC= 0.816IDC ..... (1)
[0006] And that the input current IAC of current detector 8 output should be controlled, a difference with the current control command of armature-voltage control machine 11 output is acquired in adder subtracter 10b, this adder subtracter 10b output is given as a control command of a current limiter 12, and, therefore, current control is performed by the gate control of the thyristor which is the solid state switch of a power converter 2 through the gate control machine 13. Moreover, although there is also the approach of detecting the output current of a power converter 2 directly, and controlling this, as shown in a formula (1), it is equivalent, and any may be used.
[0007]
[Problem(s) to be Solved by the Invention] However, when the load effect of rapid drive and absorption generates this kind of thing to a motor 6, the direct current voltage of an inverter circuit 5 is sharply changed according to the delay of the control response by the smoothing circuit of a power converter 2, and a reactor 3 and a capacitor 4. Drawing 4 shows behavior transition of fluctuation of the output current of a power converter, and output voltage, IDC is the output current and VDC is output voltage. That is, if the load of a motor 6 is changed to a drive and absorption, the output current IDC of a power converter 2 will be changed

sharply, and output voltage VDC will be sharply changed by this. Therefore, such big voltage variation may cause evils, such as overcurrent generating by fluctuation of the torque of a motor, breakage of the driver element of an inverter circuit, and the commutation failure at the time of power regeneration.
[0008]
[Means for Solving the Problem] By making this invention in view of a point which was mentioned above, and the load effect of a motor appearing in the size of the input current of an inverter circuit in proportion to that magnitude, namely, regarding load sudden change of a motor as sudden change of the input current of an inverter circuit as it is, and amending the current control command of a power converter through a disturbance observer after detecting this current, it constitutes so that fluctuation of the input voltage of an inverter circuit may be reduced. It perceives also changing the current of the capacitor for smooth with load sudden change of a motor, and it constitutes and consists of the still more nearly same way of thinking so that this capacitor current may be detected and may be compensated similarly.
[0009]
[Function] An operation of this solution means is combined and explained in full detail in the example described below. Below, based on a drawing, detail explanation of this invention is given further.
[0010]
[Example] Drawing 1 is what was [an example] similar and expressed one example to which this invention was applied to drawing 3 , and 14 is [a load compensation machine and 10c of a current detector and 15] adder subtracters. In addition, although a power converter 2 is the example of the reversible regeneration method of the three phase bridge by the thyristor switch here, you may come to use a transistor, IGBT, etc. for the solid state switch. The current detector 14 detects the DC-power-supply current of an inverter circuit 2, detects the output current IDC, and carries out a signal output at the load compensation machine 15. This load compensation machine 15 output is given as one input of adder subtracter 10c, and armature-voltage control machine 11 output is given to adder subtracter 10c as other inputs. Furthermore, the configuration that the adder subtracter 10c output is given to adder subtracter 10b is made.
[0011] From this, adder subtracter 10a (VS-VDC) is computed, it considers as the input signal of the armature-voltage control machine 11, and the current command value IS 1 is acquired. Amendment by load compensation machine 15 output is added to the current command value IS 1 in adder subtracter 10c, and the current command value IS 2 is acquired. Adder subtracter 10b (IS2-IAC) is computed, and the control command signal of a current limiter 12 is acquired.
[0012] And if a motor load is changed, the current of the DC power supply of an inverter circuit will be changed, and an electrical potential difference will be changed. Although it is controlled so that the armature-voltage control machine 11 operates and output voltage VDC becomes fixed in order to reduce fluctuation of the electrical potential difference, the point that a control response cannot be followed to sudden change of a motor load can be canceled as follows. The load compensation machine 15 consists of functions expressed with a degree type (2) or a formula (3) here.
[0013]
(1+TD-s) /(1+TI-s) ..... (2)
(TD-s)/(1+TI-s) ..... (3)
[0014] Namely, the denominator (1+TIands) of the function in a formula (2) and (3) is designed in order to remove the disturbance input and RF pulsation of a high-frequency field on control compensation, and as for the molecule (1+TD-s) or molecule (TD-s) of a function, primary [of current control] is designed as a purpose of phase progress control. Here, the relation between TD and TI is designed so that it may become (TD>TI). ** -- by making it like, being taken in functional relation [in / for fluctuation of the input current of an inverter circuit 2 / the load compensation machine 15], and applying the compensation output to the control command of a current limiter 12 for compensation, the control correspondence to the load effect in armature-voltage control is improved, and voltage variation can be reduced. When it is [this] similar and it is expressed to drawing 4 as behavior of the output current IDC and output voltage VDC, it is shown like drawing 2 .
[0015] Furthermore, this example can act as following. Generally, the thyristor converter has the control function of the output current to this equipment itself. However, smooth [of the fluctuation of the load current] is carried out, and it follows and controls by the reactor 3 and the capacitor 4 to fluctuation of the rapid load current, and is ******. Here, the above-mentioned function enables it positively to control by being impressed by the power control command of a power converter 2 to the input current of an inverter circuit, i.e., the load effect of a motor, that fluctuation of the electrical potential difference of the capacitor by the power converter should be made few by making lead compensation into a disturbance observer. In addition, it is also clear act [it / similarly] to replace with the current detector 14 and to acquire the current

of a capacitor 4.
[0016]
[Effect of the Invention] As explained above, while being able to offer the simple equipment which can reduce the voltage variation of the input power of an inverter circuit according to a rank according to this invention, stable operation by the inverter circuit is realized, and the inverter circuit breakage by the overvoltage can be prevented.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing 1 is the control-block Fig. showing the important section configuration of one example of this invention.
[Drawing 2] Drawing 2 is drawing showing behavior transition of fluctuation of the output current of a power converter, and output voltage by drawing 1 .
[Drawing 3] Drawing 3 is the control-block Fig. showing the conventional example.
[Drawing 4] Drawing 4 is drawing showing behavior transition of fluctuation of the output current of a power converter, and output voltage by drawing 3 .
[Description of Notations]
1 AC Power Supply
2 Power Converter
3 Reactor
4 Capacitor
5 Inverter Circuit
6 Induction Motor (Motor)
7 Electrical-Potential-Difference Detector
8 Current Detector
9 Electrical-Potential-Difference Setter
11 Armature-voltage Control Machine
12 Current Limiter
13 Gate Control Machine
14 Current Detector
15 Load Compensation Machine

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* NOTICES *

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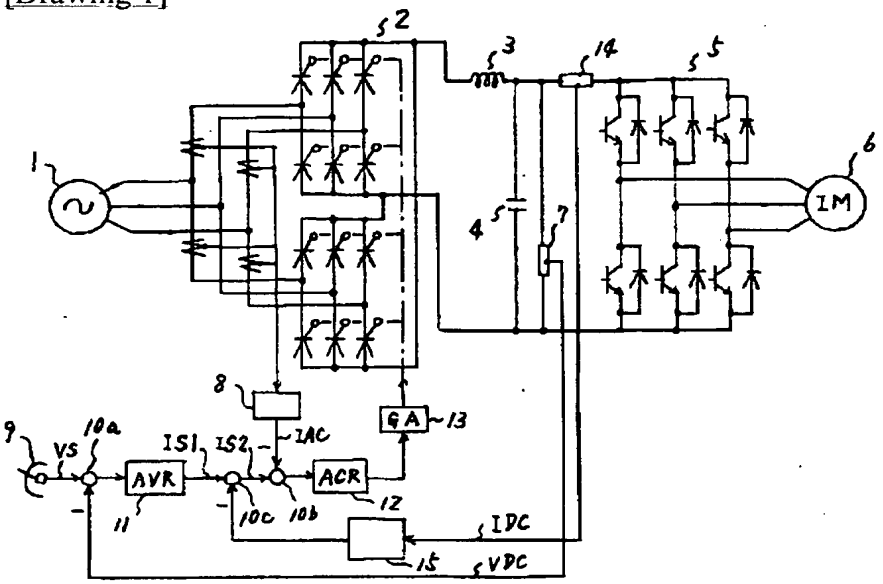
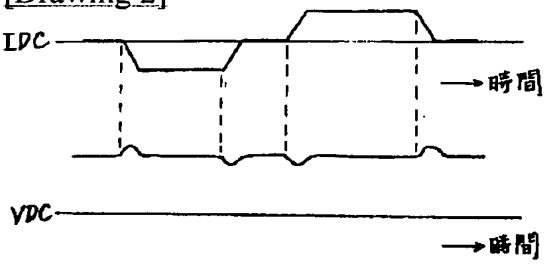
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

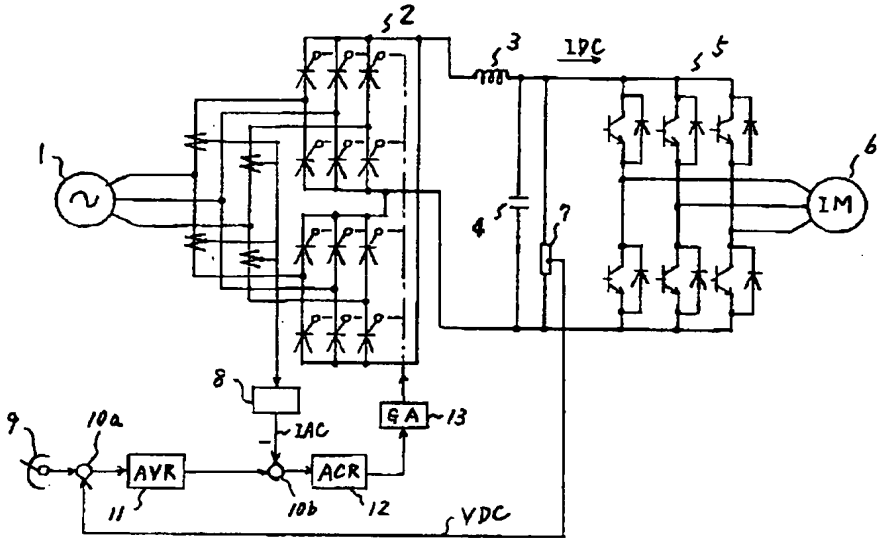
[Drawing 1]



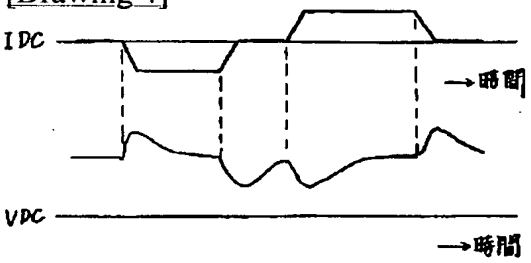
[Drawing 2]



[Drawing 3]



[Drawing 4]



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